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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/072,637	02/05/2002	Calvin Chao	1092-PA440	3248

7590 10/16/2003

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EXAMINER	
HANNAHER, CONSTANTINE	
ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 10/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	10/072,637	CHAO ET AL.	
	Examin r	Art Unit	
	Constantine Hannaher	2878	

-- The MAILING DATE of this communication appears on th cover sheet with th correspond nc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-76* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-18,20-35,37-39,42-56,58-73,75 and 76* is/are rejected.

7)☒ Claim(s) *2,3,19,36,40,41,57 and 74* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☒ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *20020816* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information Disclosure Statement

1. As set forth in MPEP § 609:

> 37 CFR 1.98(b) requires that each item of information in an IDS be identified properly. U.S. patents must be identified by the inventor, patent number, and issue date. U.S. patent application publications must be identified by the applicant, patent application publication number, and publication date. U.S. applications must be identified by the inventor, the eight digit application number (the two digit series code and the six digit serial number), and the filing date. If a U.S. application being listed in an IDS has been issued as a patent, the applicant should list the patent in the IDS instead of the application. Each foreign patent or published foreign patent application must be identified by the country or patent office which issued the patent or published the application, an appropriate document number, and the publication date indicated on the patent or published application. Each publication must be identified by publisher, author (if any), title, relevant pages of the publication, date and place of publication. The date of publication supplied must include at least the month and year of publication, except that the year of publication (without the month) will be accepted if the applicant points out in the information disclosure statement that the year of publication is sufficiently earlier than the effective U.S. filing date and any foreign priority date so that the particular month of publication is not in issue. The place of publication refers to the name of the journal, magazine, or other publication in which the information being submitted was published.

The identification of the inventor is faulty. The identification of the patent number is faulty.

No publisher, no relevant pages of publication, no date and place of publication is identified.

Oath/Declaration

2. With respect especially to the declaration submitted July 2, 2003:

3. The oath or declaration is defective. A new oath or declaration in compliance with 37

CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP

§§ 602.01 and 602.02.

The oath or declaration is defective because:

It is not plainly and legibly written either by a typewriter or machine printer in permanent dark ink or its equivalent, as required under 37 CFR 1.52(a)(1)(iv).

When applicant states that the post office address is the "same" as residence applicant's representative should keep in mind that a "residence" is a city and state or foreign country. The superfluous information given for residence is accepted as constituting a mailing address. The Office has been able to discern the city and state or foreign country of residence from the information supplied. See the requirements of 37 CFR 1.63(c)(1) as amended effective November 7, 2000.

Specification

4. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Note the use of "is disclosed" which can be implied and of "comprising" (legal phraseology).

Claim Objections

5. Claims 8 and 46 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Independent claims 1 and 39 already require two transistors in each pixel circuit.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or

with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 8 and 46 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification identifies at page 21, line 19 the potential for each pixel circuit to have but two transistors, but this identification is inadequate to lead one of ordinary skill in the art to decide which of the minimum of four transistors otherwise disclosed can be omitted to achieve a pixel circuit with but two transistors.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 1, 4-9, 11-18, 20, 23, 24, 27-35, 37-39, 42-47, 48-56, 58, 61, 62, 65-73, 75, and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Theil *et al.* (US006114739A) in view of Kochi *et al.* (US006605850B1).

With respect to independent claims 1 and 39, Theil *et al.* discloses an active pixel sensor (column 1, lines 7-8) for producing images from electron-hole producing radiation (column 2, lines 8-9) comprising a solid state radiation detection unit (Fig. **2**) comprising a semiconductor substrate **40**, a plurality of complementary metal oxide semiconductor pixel circuits incorporated into said substrate to form an array of pixel circuits (column 3, lines 29-31) wherein each of said array of pixel circuits comprises a charge collecting pixel electrode **44**, a radiation absorbing layer **44**, **46**, **48** comprised of photoconductive material covering at least a portion of said array of pixel circuits, wherein said photoconductive material is photoconductive on exposure to said electron-hole producing radiation, a surface electrode layer **50** comprised of electrically conducting material and formed on said radiation absorbing layer, wherein said surface electrode layer is at least partially transparent to said electron-hole producing radiation (column 3, line 22, or column 5, lines 40-41), and connected to a voltage source for establishing an electrical field across said radiation absorbing layer and between said surface electrode layer and each of said array of charge collecting pixel electrodes (column 5, lines 38-39) and an array measurement circuit for measuring charges collected by each of said array of charge collecting pixel electrodes, and for outputting pixel data indicative of said collected charges, wherein said pixel data comprises information defining an image (column 4, lines 29-31). Plainly, Theil *et al.* does not identify the construction of the pixel circuits, so it would have been obvious to one of ordinary skill in the art at the time the invention was made to look to the art for guidance as to the nature of such pixel circuits. Kochi *et al.* discloses an imaging sensor on a semiconductor substrate **10** with CMOS pixel circuits (Fig. **7**, column 6, line 36). Each pixel circuit

in the sensor of Kochi *et al.* comprises a photodiode **901**, charge sensing node **912**, a gate bias transistor **911** separating the photodiode and the charge sensing node, a pixel capacitor **913**, and a charge measuring circuit **903** comprising at least one transistor, wherein a gate of said at least one transistor is electrically connected to said charge sensing node **912**. In view of the effective performance of the CMOS pixel circuit disclosed by Kochi *et al.* in processing the output of photoconductive radiation absorbing layers (photodiode) in a CMOS environment, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the active pixel sensor of Theil *et al.* to comprise CMOS pixel circuits between the charge collecting pixel electrode **44** and the array measurement circuit in substrate **40**. Crystallinity of the semiconductor substrate is routine. The steps of providing, incorporating, covering, and forming are sufficiently generic that one of ordinary skill in the art would have used them to fabricate the active pixel sensor suggested by Theil *et al.* and Kochi *et al.*

With respect to dependent claims 4-7 and 42-45, Fig. **8** of Kochi *et al.* hatches the connection between elements **911** and **903** as metal. One of ordinary skill in the art would have been aware of a variety of substitutions effective in the CMOS environment.

With respect to dependent claims 8, 9, 46, and 47, the pixel circuit suggested by Kochi *et al.* comprises a number of transistors within the claimed range.

With respect to dependent claims 11 and 49, the pixel capacitor **913** has a logical existence in Fig. **7** of Kochi *et al.* but is not identified in the plan view of Fig. **8**. Accordingly, it is considered to be defined by the structure between said charge sensing node **912** and the semiconductor substrate **10**.

With respect to dependent claims 12-18 and 50-56, one or more of the layers **44**, **46**, **48** of the radiation absorbing layer disclosed by Theil *et al.* are as recited.

With respect to dependent claims 20 and 58, the radiation absorbing layer of Theil *et al.* is as recited.

With respect to dependent claims 23 and 61, the i-layer **46** of Theil *et al.* is as recited.

With respect to dependent claims 24 and 62, Theil *et al.* discloses the recited arrangement (column 4, lines 62-65).

With respect to dependent claims 27 and 65, the i-layer **46** of Theil *et al.* would be as recited in a NIP configuration.

With respect to dependent claims 28, 29, 66, and 67, the layer **46** of Theil *et al.* is as recited.

With respect to dependent claims 30-32 and 68-70, the charge collecting pixel electrode in the active pixel sensor of Theil *et al.* also comprises patterned metal plate **45** and the surface of a single via (*e.g.*, **52**).

With respect to dependent claims 33-35 and 71-73, Theil *et al.* identifies suitable materials for the surface electrode layer **50** at column 6, lines 63-65.

With respect to dependent claims 37, 38, 75, and 76, in view of the continuous layers in the photoconductive radiation absorbing layer of the active pixel sensor of Theil *et al.*, the fill factor is considered to be within the claimed ranges.

11. Claims 10 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Theil *et al.* (US006114739A) and Kochi *et al.* (US006605850B1) as applied to claims 1 and 39 above, and further in view of Merrill (US20020036700A1).

With respect to dependent claims 10 and 48, Merrill shows (Fig. **3**) that additional transistors in each pixel circuit of an active pixel sensor are useful in reducing kTC noise. In view of the effective performance, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to specify a number of transistors in the pixel circuit suggested by Kochi *et al.* which was within the claimed range.

12. Claims 21, 22, 25, 26, 59, 60, 63, and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Theil *et al.* (US006114739A) and Kochi *et al.* (US006605850B1) as applied to claims 20, 24, 58, and 62 above, and further in view of Thierry (US005844292A).

With respect to dependent claims 21, 22, 25, 26, 59, 60, 63, and 64, although Theil *et al.* only specifies "hydrogenated" amorphous silicon for the i-layer **46**, Thierry shows that it is routine to manufacture p-i-n photodiodes with all three layers as a-Si:H (column 3, lines 66-67). In view of the effective performance and various advantages discussed by Thierry, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the active pixel sensor suggested by Theil *et al.* and Kochi *et al.* such that layers **44**, **46**, **48** were of hydrogenated amorphous silicon.

Allowable Subject Matter

13. Claims 2, 3, 19, 36, 40, 41, 57, and 74 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

14. The following is a statement of reasons for the indication of allowable subject matter: Kochi *et al.* makes no suggestion regarding (near) equality of potential or bias; although the p-layer **48** of Theil *et al.* may be omitted (column 5, lines 26-30) there is no suggestion to omit the i-layer.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Constantine Hannaher whose telephone number is (703) 308-4850. The examiner can normally be reached on Monday-Friday with flexible hours.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David P. Porta can be reached on (703) 308-4852. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

ch

Constantine Hannaher
Primary Examiner